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TECHNICAL REPORT

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Communication networks and systems for power utility automation – Part 90-14: Using IEC 61850 for FACTS (flexible alternate current transmission systems), HVDC (high voltage direct current) transmission and power conversion data modelling

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CONTENTS

FOREWORD 11
INTRODUCTION 13
1 Scope 14
1.1 Namespace name and version 14
1.2 Code Component distribution 15
2 Normative references 16
3 Terms, definitions, variable symbols and abbreviated terms 17
3.1 Terms and definitions 17
3.2 Variable symbols 17
3.3 Abbreviated terms 18
4 FACTS Controllers and power conversion definition and specific requirements – Definitions of FACTS and power conversions 20
4.1 Flexible AC transmission system 20
4.1.1 General 20
4.1.2 Examples of FACTS for shunt compensation 20
4.1.3 Examples of series compensation 20
4.2 Power conversions systems 21
5 Scope clarification and definition 21
5.1 General 21
5.2 Communication requirements and data flow 22
5.2.1 General 22
5.2.2 Mapping to interfaces defined in IEC 61850-5 23
5.3 SCL modelling requirements 24
6 Shared use cases for FACTS controllers and Power Conversion 24
6.1 Commonly used actors 24
6.2 Use case: Control system redundancy 26
6.2.1 Communication redundancy 26
6.2.2 Functional application redundancy 26
6.3 Use case: Control location and authority 27
6.4 Use case: System status and generic sequence processing 29
6.4.1 General 29
6.4.2 ASEQ Application Overview 33
6.4.3 Application example HVDC 34
6.4.4 Application example Shunt connected FACTS device 37
6.5 Use case: Cooling system 40
6.5.1 General 40
6.5.2 List of logical nodes for modelling of a Water based cooling system 43
6.5.3 Example of modelling a cooling system 43
6.6 Use case: Control and supervision of Harmonic filter 45
6.7 Use case: Control of external devices as part of automatic reactive power control 46
6.7.1 General 46
6.7.2 Modelling example for external device control of a FACTS shunt device 49
6.8 Use case: Converter status during degraded operation 50
6.9 Use case: Power Semiconductor application monitoring 51
6.9.1 General 51
6.9.2 Equipment Indications and Properties 55

6.9.3 Modelling requirements, results, conclusion 56
6.10 Use case: Coordinated control between FACTS and other Power Conversion devices 56
6.10.1 General 56
6.10.2 Use case descriptions 58
6.10.3 Optimized signal list and process information for modelling 59
6.11 FACTS and Power Conversion Protection 60
6.11.1 General 60
6.11.2 Use case Protective action 60
6.11.3 Modelling summary 62
7 FACTS 62
7.1 General 62
7.2 Shunt connected FACTS devices 63
7.2.1 General 63
7.2.2 Overview 63
7.2.3 Use cases for Shunt Connected FACTS device 64
7.3 Series connected FACTS devices 81
7.3.1 Overview 81
7.3.2 Use case of Series Compensation 81
7.3.3 Series Capacitors protections 99
8 Power Conversion 104
8.1 Power Converters 104
8.1.1 Overview 104
8.1.2 Power converter use cases with signal and data item descriptions 105
8.2 HVDC 122
8.2.1 Overview 122
8.2.2 HVDC use cases with signal and data item descriptions 123
8.3 SFC – Static Frequency Converter 147
8.3.1 Overview 147
8.3.2 SFC use cases with signal and data item descriptions 147
9 Data model 149
9.1 Abbreviated terms used in data object names 149
9.2 Logical node preliminaries 149
9.2.1 Package LogicalNodes_90_14 149
9.3 Data object name semantics and enumerations 222
9.3.1 Data semantics 222
9.3.2 Enumerated data attribute types 231
10 SCL Extensions 238
Annex A (informative) Introduction to FACTS applications 239
A.1 Static Var Compensator overview 239
A.2 Static Synchronous Compensator overview 241
A.3 Fixed series compensation 243
A.4 Mechanically Switched Series Reactor (MSSR) 244
A.5 Thyristor Controlled Series Capacitor (TCSC) 244
Annex B (informative) Modelling guideline and examples 247
B.1 Indication and control of breakers and switches 247
B.2 Power transformer 247
B.3 Metering and measured values 247

B.4 Examples of modelling of FACTS Shunt devices 247
B.5 Example of modelling of Fixed Series Compensation 251
B.6 Examples of modelling of HVDC transmission 252
Bibliography 253

Figure 1 – Conceptual view of communication paths considered in this report 21
Figure 2 – Levels and logical interfaces in substation automation systems 22
Figure 3 – Data flow of a FACTS / Power Conversion controller 23
Figure 4 – Shared use cases for FACTS controllers and Power Conversion 24
Figure 5 – Hierarchal view of commonly used actors 26
Figure 6 – Typical redundant FACTS/Power Conversion control system setup 27
Figure 7 – Authority for control of devices from different control levels and locations 28
Figure 8 – Typical scheme for implementation of control authority for function groups 29
Figure 9 – System status / generic sequence processing 30
Figure 10 – ASEQ Application Overview (using the most important Data Objects) 34
Figure 11 – Exemplary sequence diagram, not applicable to all use cases 35
Figure 12 – Operating states of a FACTS shunt device 37
Figure 13 – Use case diagrams of State use case 39
Figure 14 – Cooling control use cases 41
Figure 15 – Cooling control modelling example 44
Figure 16 – Harmonic filter control and supervision 45
Figure 17 – Use case Control of external reactive components 47
Figure 18 – Modelling external banks for reactive power optimization. 49
Figure 19 – Use case Converter status 50
Figure 20 – Example of a hierarchical arrangement of power electronic units 51
Figure 21 – Arrangement of 12 thyristor valves in a 12-pulse converter configuration 52
Figure 22 – Use cases for semiconductor application monitoring 53
Figure 23 – Schematic view of two SVC devices connected in parallel. 56
Figure 24 – Coordination between two FACTS / Power Conversion 57
Figure 25 – Use case diagram for coordinated FACTS device operation 57
Figure 26 – Coordination signals between two SVCs 58
Figure 27 – Optimized signal list for IEC 61850 59
Figure 28 – Use cases for Control System Protective Actions 61
Figure 29 – V-I diagram of a generic SVC 63
Figure 30 – V-I diagram of a generic STATCOM 64
Figure 31 – Use cases for substation control of a shunt connected FACTS device. 64
Figure 32 – Example of operating states of a FACTS shunt device 66
Figure 33 – Example of control modes of a shunt connected FACTS device visualized as a state machine 66
Figure 34 – Use cases for changing states of FACTS device 67
Figure 35 – Change of control mode use case 68
Figure 36 – Sub-use cases of Configuration use case 70
Figure 37 – Automatic Reactive Power Control use case 72
Figure 38 – Non-automatic control mode use case 73

Figure 39 – Simplified fixed reactive power regulator block diagram 74
Figure 40 – Simplified voltage regulator block diagram of automatic voltage control mode for an SVC 74
Figure 41 – Shunt connected FACTS device operating characteristic with slow susceptance/reactive power regulator 76
Figure 42 – Example of automatic voltage control system with additional reference signal for POD 77
Figure 43 – Activation of Gain Optimizer Function 78
Figure 44 – Reset Gain Command Interaction Diagram 78
Figure 45 – Series Compensation Use case 82
Figure 46 – Use cases for Fixed Series Capacitors 83
Figure 47 – Use case for Capacitor Discharge function 84
Figure 48 – Use case for By-passing 85
Figure 49 – Sub use cases for Lock-out use case 87
Figure 50 – Sub use cases for auto reinsertion 89
Figure 51 – Interaction of Automatic Reinsertion function with other functions 90
Figure 52 – Example of states in Automatic reinsertion function 91
Figure 53 – SLD of Fast Protective Equipment 93
Figure 54 – Use case for Fast Protective equipment 94
Figure 55 – SLD symbol for Metal Oxide Varistor 95
Figure 56 – Zink Oxide Varistor use case 96
Figure 57 – MSSR Use case diagram 97
Figure 58 – Additional use cases for TCSC 99
Figure 59 – SC Protection function Interface 101
Figure 60 – Varistor Overload Protection use case 104
Figure 61 – Varistor Failure Protection use case 104
Figure 62 – Generic application of Power Conversion 105
Figure 63 – Use Active / reactive power operation mode selection 106
Figure 64 – Active power control use case 108
Figure 65 – P-f characteristic 110
Figure 66 – P-V characteristic 111
Figure 67 – Example: Simple 4-point P-DCVol characteristic 112
Figure 68 – Example: Sophisticated 9-point P-DCVol characteristic 113
Figure 69 – P_Fixed 114
Figure 70 – Reactive power control use case 115
Figure 71 – Q-V characteristic 116
Figure 72 – Q_Fixed 117
Figure 73 – Phi_Fixed 118
Figure 74 – V_Band 119
Figure 75 – Use case 121
Figure 76 – Typical HVDC setup 123
Figure 77 – Use case Power direction change 124
Figure 78 – Use case Run-up/Run-back modules 126
Figure 79 – General AEPC functional characteristic 128

Figure 80 – Use case Automatic Emergency Power Control 129
Figure 81 – DC Line fault recovery sequence 133
Figure 82 – Examples for typical HVDC DC-Yard configurations 136
Figure 83 – DC Yard configuration 137
Figure 84 – Coordinated mode switchover 138
Figure 85 – Function mode switchover 140
Figure 86 – Tap changer control and supervision 145
Figure 87 – Typical SFC setup 147
Figure 88 – Control by external reference 148
Figure 89 – Class diagram LogicalNodes_90_14::LogicalNodes_90_14 150
Figure 90 – Class diagram AbstractLNs::AbstractLNs 151
Figure 91 – Class diagram LNGroupA::LNGroupANew 155
Figure 92 – Class diagram LNGroupA::LNGroupAExt 156
Figure 93 – Class diagram LNGroupC::LNGroupCNew 174
Figure 94 – Class diagram LNGroupF::LNGroupFNew 184
Figure 95 – Class diagram LNGroupP::LNGroupPNew 186
Figure 96 – Class diagram LNGroupR::LNGroupRNew 194
Figure 97 – Class diagram LNGroupS::LNGroupSNew 198
Figure 98 – Class diagram LNGroupT::LNGroupT 204
Figure 99 – Class diagram LNGroupX::LNGroupXNew 206
Figure 100 – Class diagram LNGroupZ::LNGroupZNew 210
Figure 101 – Class diagram LNGroupZ::LNGroupZNew2 211
Figure A.1 – Example SVC circuit diagram of an SVC 239
Figure A.2 – SLD of example SVC with reference designations 240
Figure A.3 – Simplified STATCOM Circuit diagram 241
Figure A.4 – Example of SLD for a STATCOM with reference designations 242
Figure A.5 – Hybrid solution with two VSC, TSC and TCR branch 243
Figure A.6 – Single Line Diagram of a one segment Series Capacitor. 243
Figure A.7 – Generic SLD of MSSR/OLC FACTS device 244
Figure A.8 – SLD of TCSC and transmitted power vs. transmission angle 245
Figure A.9 – Generic TCSC control system 246
Figure B.1 – Logical nodes representing SLD equipment SVC 248
Figure B.2 – Modelling example of SVC functionality 249
Figure B.3 – Logical nodes representing SLD equipment, STATCOM 250
Figure B.4 – Logical nodes representing SLD equipment, Control and Protection, Fixed SC 251
Figure B.5 – Logical Nodes representing HVDC specific equipment and functionality 252

Table 1 – Attributes of (Tr)IEC 61850-90-14:2020A namespace 15
Table 2 – Tracking information of (Tr)IEC 61850-90-14:2020A namespace building-up 15
Table 3 – Actors used in use cases 25
Table 4 – Use case: System status and generic sequence processing 31
Table 5 – Use case: State 40

Table 6 – Use case: Cooling system 41
Table 7 – Logical nodes for modelling a water-based cooling system 43
Table 8 – Use case: Control and supervision of Harmonic filter 46
Table 9 – Use case: Control of external banks mode 48
Table 10 – Process data for Control of external banks mode 49
Table 11 – Use case: Get Converter Status 51
Table 12 – Use case: Semiconductor application monitoring 53
Table 13 – Thyristor controlled reactive components 55
Table 14 – Process information for Thyristor controlled reactive component 55
Table 15 – Coordinated FACTS device operation use case 58
Table 16 – Process information for coordinated control mode 60
Table 17 – Use cases for Control System Protective Actions 61
Table 18 – Classification of FACTS Controllers 63
Table 19 – Main use cases of FACTS Shunt device 65
Table 20 – Changing states of FACTS device use cases 68
Table 21 – Main control functions 69
Table 22 – Supplementary control functions 69
Table 23 – Additional control mode functions 69
Table 24 – Use case: Control Mode selection 69
Table 25 – Change Control mode process data 70
Table 26 – Use case: Configuration of control mode 71
Table 27 – Automatic Reactive Power Control process data 72
Table 28 – Non-automatic control mode use case 73
Table 29 – Non-automatic control mode setpoints 73
Table 30 – Reactive power control mode process data 74
Table 31 – Additional functions in Automatic Voltage Control mode 75
Table 32 – Voltage Control mode process data 75
Table 33 – Process data for slow susceptance regulator mode or reactive power regulator 76
Table 34 – POD mode settings and controls 77
Table 35 – Use case: Gain 79
Table 36 – Gain Supervision mode data objects 79
Table 37 – Gain Optimizer mode data objects 79
Table 38 – Protective Control Functions of SVC use cases 80
Table 39 – Protective Control Functions of a VSC use cases 81
Table 40 – Use case: Series Compensation 82
Table 41 – Use case: Fixed Series compensation 84
Table 42 – Use case: Capacitor Discharge Function 85
Table 43 – Bypassing of series capacitor 86
Table 44 – Use case: Lock-out and temporary block insertion 87
Table 45 – Use case: Auto reinsertion 90
Table 46 – Transition description for Figure 55 92
Table 47 – Use case: Fast Protective Equipment 95

Table 48 – Use case: Zink Oxide Varistor 97
Table 49 – Use case: MSSR 98
Table 50 – Indications and measurements 98
Table 51 – Use case: TCSC 99
Table 52 – Overview of typical series capacitor bank protections, based on IEC 60143-2 100
Table 53 – Use case: SC protection functions 102
Table 54 – Series protections modelling guideline 103
Table 55 – Use case: Active / reactive power operation mode selection 106
Table 56 – Use case: Active power control 109
Table 57 – New data items for P-f-characteristics 111
Table 58 – New data items for P-V 112
Table 59 – New data items for P-DCVol 113
Table 60 – New data items for fixed active power 114
Table 61 – New data items for fixed DC current 114
Table 62 – New data items for Active power (general) 114
Table 63 – Reactive Power control use case (Power Conversion) 116
Table 64 – New data items for Q-V 117
Table 65 – New data items for Q_fixed 117
Table 66 – New data items for Q_Band 118
Table 67 – New data items for Phi_Fixed 118
Table 68 – New data items for V_Band 119
Table 69 – New data items for Reactive power (general), ... 119
Table 70 – Use case Reactive power (Power Conversion) 120
Table 71 – Intermediate DC circuit use case 122
Table 72 – Use case Power direction change 125
Table 73 – Use case Run-up/Run-back modules 127
Table 74 – Use case Automatic Emergency Power Control 129
Table 75 – AEPC data modelling example 131
Table 76 – Use case: DC Line fault recovery sequence 134
Table 77 – Use case: DC Yard configuration 137
Table 78 – Use case: Coordinated mode switchover 139
Table 79 – Use case: Function mode switchover 141
Table 80 – Use case: Tap changer control and supervision 145
Table 81 – Use case: Control by external reference 148
Table 82 – Normative abbreviations for data object names 149
Table 83 – Data objects of FACTSandPowerConversionLN 152
Table 84 – Data objects of ReactiveComponentInterfaceLN 153
Table 85 – Data objects of EmergencyPowerControl_PowerRunUpRunBackLN 154
Table 86 – Data objects of ARCOExt 157
Table 87 – Data objects of AFLK 159
Table 88 – Data objects of AMSR 160
Table 89 – Data objects of APOD 162
Table 90 – Data objects of AEPC 163

Table 91 – Data objects of ARUB 165
Table 92 – Data objects of ASEQ 166
Table 93 – Data objects of ATCCExt 168
Table 94 – Data objects of ARPC 171
Table 95 – Data objects of AVCOExt 172
Table 96 – Data objects of CCGRExt 175
Table 97 – Data objects of CCAP 177
Table 98 – Data objects of CJCL 178
Table 99 – Data objects of CFPC 180
Table 100 – Data objects of CREL 183
Table 101 – Data objects of FFUN 184
Table 102 – Data objects of PLFR 187
Table 103 – Data objects of PMHE 189
Table 104 – Data objects of PMHT 190
Table 105 – Data objects of PMOV 192
Table 106 – Data objects of PFPE 193
Table 107 – Data objects of RBPF 195
Table 108 – Data objects of RRIN 196
Table 109 – Data objects of SCND 199
Table 110 – Data objects of SFLW 200
Table 111 – Data objects of SFPE 201
Table 112 – Data objects of SPES 203
Table 113 – Data objects of TCND 205
Table 114 – Data objects of XFPE 207
Table 115 – Data objects of XDCC 209
Table 116 – Data objects of ZCONExt 211
Table 117 – Data objects of ZHAF 213
Table 118 – Data objects of ZLINExt 215
Table 119 – Data objects of ZMOV 217
Table 120 – Data objects of ZTCRExt 218
Table 121 – Data objects of ZCAPExt 220
Table 122 – Data objects of ZREAExt 221
Table 123 – Attributes defined on classes of LogicalNodes_90_14 package 222
Table 124 – Literals of ActivePowerModKind 232
Table 125 – Literals of AutoReinsertionKind 232
Table 126 – Literals of ChargingDCCircuitStateKind 233
Table 127 – Literals of ConfigurationDCCircuitStateKind 233
Table 128 – Literals of ConnectionDCStateKind 233
Table 129 – Literals of ConverterTypKind 234
Table 130 – Literals of EPCModKind 234
Table 131 – Literals of EPCTypKind 234
Table 132 – Literals of ForcedOperationControlModKind 235
Table 133 – Literals of GenerationDCStateKind 235

Table 134 – Literals of HarmonicFilterTypKind 235
Table 135 – Literals of OperationCommandKind 236
Table 136 – Literals of OperationModKind 236
Table 137 – Literals of OperationStateKind 236
Table 138 – Literals of PowerDirectionalModKind 237
Table 139 – Literals of ReactivePowerModKind 237
Table 140 – Literals of RubModKind 237
Table 141 – Literals of RubTypKind 238
Table 142 – Literals of SequenceStateKind 238
Table 143 – Literals of ThyristorBranchFunctionKind 238
Table B.1 – Suggested modelling of measured and meter values 247

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COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 90-14: Using IEC 61850 for FACTS (flexible alternate current transmission systems), HVDC (high voltage direct current) transmission and power conversion data modelling

FOREWORD

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IEC TR 61850-90-14 has been prepared by working group 10: Power system IED communication and associated data models, of IEC technical committee 57: Power systems management and associated information exchange. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
57/2232/DTR	57/2273/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The language used for the development of this Technical Report is English.

A list of all parts in the IEC 61850 series, published under the general title *Communication networks and systems for power utility automation*, can be found on the IEC website.

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The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The IEC 61850 series was established to focus on the main primary equipment and functionality of conventional AC substations. By now it has been widely deployed and has become state of the art in that area.

Soon after, ambitions emerged to make IEC 61850 applicable to a largely widened range of equipment and functionality. Even completely new domains, like wind or hydro power generation, have created extensions to the series in order to match their applications.

Thanks to the very generic basic information and communication structures of IEC 61850 and the integrated services provided, most domain requirements can be easily adopted and fulfilled with IEC 61850 core functionality. Most of the extension work thus just needs to focus on creating a domain specific data modelling, which allows the semantic description of domain specific signals.

Due to the latest boom in deploying an exponentially increasing number of power electronics and semiconductor based equipment directly in the area of medium, high and ultra-high voltage transmission networks, the call for integrating those direct current related processes and control systems into IEC 61850 is only logical and consecutive.

Two main groups of DC based types of applications exist: FACTS devices (shunt and series connected) that mainly influence the network at a definite point of connection and Power Converters (e.g. HVDC, SFC) that additionally allow the transmission of active power between two different points of connection.

The benefits of those technologies are clear: as methods to influence conventional AC networks are limited, DC based technologies provide the possibility to actively adjust power flow and network parameters like frequency and voltage within just milliseconds. They help to support network stability, performance and quality, increase transmission capacity. They enable transmission tasks that would otherwise be technically borderline or impossible, moreover doing so mostly with unprecedented efficiency respectively low losses.

FACTS and Power Conversion are thus indispensable to secure power supply and represent a vital component within the backbone of efficient, reliable and resilient future smart grids. This technical report finally enables those technologies to also become an integral part of the IEC 61850 world.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 90-14: Using IEC 61850 for FACTS (flexible alternate current transmission systems), HVDC (high voltage direct current) transmission and power conversion data modelling

1 Scope

This part of IEC 61850, which is a technical report, specifies the information model of devices and functions related to systems of power utility automation, specifically related to FACTS (Flexible AC Transmission Systems) and Power Conversion applications.

The IEC 61850-90-14 information model standard utilizes existing IEC 61850-7-4 logical nodes where possible, but also defines specific logical nodes where needed.

Specifically, the scope of this document:

- Covers communication between control system of FACTS, HVDC and Power Conversion and SCADA and HMI systems
- Includes the data model for FACTS, HVDC and Power conversion devices
- Does not cover Protection relays
- Does not cover process bus
- Does not cover valve communication

1.1 Namespace name and version

This new subclause is mandatory for any IEC 61850 namespace (as defined by IEC 61850-7-1:2011).

Table 1 shows all attributes of (Tr)IEC 61850-90-14:2020A namespace.

Table 1 – Attributes of (Tr)IEC 61850-90-14:2020A namespace

Attribute	Content
Namespace nameplate	
Namespace Identifier	(Tr)IEC 61850-90-14
Version	2020
Revision	A
Release	3
Full Namespace Name	(Tr)IEC 61850-90-14:2020A
Namespace Type	transitional
Namespace dependencies	
extends	IEC 61850-7-4:2007B version:2007 revision:B
Namespace transitional status	
Future handling of namespace content	The name space (Tr)IEC 61850-90-14:2020A is considered as "transitional" since the models are expected to be included in further editions of IEC 61850-7-4xx. Potential extensions/modifications may happen if/when the models are moved to the International Standard status

The table below provides an overview of all published versions of this namespace.

Edition	Publication date	Webstore	Namespace
Edition 1.0	2020-xx	IEC TR 61850-90-14:2020	(Tr)IEC 61850-90-14:2020

Table 2 shows all tracking information of (Tr)IEC 61850-90-14:2020A namespace building-up.

Table 2 – Tracking information of (Tr)IEC 61850-90-14:2020A namespace building-up

Attribute	Content
Namespace IEC specific information	
Version of the UML model used for generating the document (informative)	wg10built7-wg18built5-wg17built6-jwg25built2-tc17built1-tc38built1_20210122.eap
Date of the UML model used for generating the document (informative)	2021-01-22
Autogeneration software name and version(informative)	j61850DocBuilder 01v12 based on jCleanCim 02v02-NS beta5

1.2 Code Component distribution

The Code Components are in light and full version:

- The full version is named: *IEC_TR_61850-90-14.NSD.2020A.Full*. It contains definition of the whole data model defined in this standard with the documentation associated and access is restricted to purchaser of this part

- The light version is named: *IEC_TR_61850-90-14.NSD.2020A3.Light*. It does not contain any documentations but contains the whole data model as per full version, and this light version is freely accessible on the IEC website for download at: http://www.iec.ch/tc57/supportdocuments, but the usage remains under the licensing conditions.

The Code Components for IEC 61850 data models are formatted in compliance with the NSD format defined by the standard IEC 61850-7-7. Each Code Component is a ZIP package containing:

- the electronic representation of the Code Component itself (possibly multiple files),
- the grammar files (XSD) enabling to check the consistency of the associated files against the defined version of NSD, but as well against the IEC 61850 flexibility rules in case of private extensions
- a file describing the content of the package (IECManifest.xml)

The IECManifest file contains different sections giving information on:

- The copyright notice
- The identification of the code component
- The publication related to the code component
- The list of the electronic files which compose the code component
- An optional list of history files to track changes during the evolution process of the code component

The life cycle of a code component is not restricted to the life cycle of the related publication. The publication life cycle goes through two stages, Version (corresponding to an edition) and Revision (corresponding to an amendment). A third publication stage (Release) allows publication of Code Component in case of urgent fixes of InterOp Tissues, thus without need to publish an amendment.

Consequently new release(s) of the Code Component may be released, which supersede(s) the previous release, and will be distributed through the IEC TC57 web site at: http://www.iec.ch/tc57/supportdocuments.

The latest version/release of the document will be found by selecting the file named *IEC_TR_61850-90-14.NSD.{VersionStateInfo}.Light* with the filed VersionStateInfo of the highest value.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC TS 61850-2, *Communication networks and systems for power utility automation – Part 2: Glossary*

IEC 61850-5:2013, *Communication networks and systems for power utility automation – Part 5: Communication requirements for functions and device models*
IEC 61850-5:2013/AMD1:2021

IEC 61850-6:2009, *Communication networks and systems for power utility automation – Part 6: Configuration description language for communication in electrical substations related to IEDs*
IEC 61850-6:2009/AMD1:2018

IEC 61850-7-2:2010, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)*
IEC 61850-7-2:2010/AMD1:2020

IEC 61850-7-3:2010, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*
IEC 61850-7-3:2010/AMD1:2020

IEC 61850-7-4:2010, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*
IEC 61850-7-4:2010/AMD1:2020

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